had sustained a preoperative weight loss of 20 percent or more.

More recently other parameters that are influenced by nutritional status also have been correlated with postoperative morbidity and mortality. Thus, serum albumin levels less than 3 grams per dl and transferrin levels less than 220 mg per dl are associated with a significant increase in the incidence of postoperative complications, and similar adverse effects are observed when patients exhibit impaired reactivity to a panel of standard skin test antigens such as purified-protein derivative (PPD), mumps, streptokinase-streptodornase, *Candida* and *Trichophyton*. A nearly eightfold increase in postoperative mortality and a fourfold increase in postoperative sepsis were reported by Pietsch and associates among surgical patients who failed to react to any of these five antigens before undergoing operation. Furthermore, when sequential skin testing indicates an improvement in immune reactivity, a reduced incidence of complications is observed.

These putative nutritional measurements are relatively insensitive indicators, however, and are subject to a variety of nonnutritional influences that may confound interpretation. In addition, prolonged starvation is not a prerequisite for the development of adverse clinical consequences; significant functional abnormalities have been observed after only ten days of nutritional deprivation.

Available data lead logically to the hypothesis that improving the nutritional state before a surgical procedure should have a salutary effect on the postoperative course. Only recently, however, has the effect of preoperative nutritional therapy been subjected to careful investigation. Many studies indicate that nutritional indices can be maintained or improved by intensive nutrition therapy, but the effect on postoperative morbidity and mortality has been variable. Total parenteral nutrition given for less than five days preoperatively is of little benefit. However, malnourished patients with inflammatory bowel disease who receive at least five days of total parenteral nutrition are found to have significantly fewer postoperative complications than those patients who do not receive this treatment.

Mullen and co-workers evaluated the effect of at least seven days of preoperative administration of total parenteral nutrition on the postoperative course of a group of patients deemed to be at high risk for the development of complications because of malnutrition. This high-risk group was identified by calculating the patients' prognostic nutritional index, a computer-generated regression equation taking into account serum albumin and transferrin concentrations, triceps skinfold thickness and delayed-hypersensitivity skin test reactivity. Preoperative administration of total parenteral nutrition was associated with a 2.4-fold reduction in all complications, a nearly sevenfold reduction in the incidence of major sepsis and a fivefold reduction in mortality. No benefit was observed, however, in the less severely malnourished patients.

In a recent randomized trial, Muller and colleagues observed a significant reduction in the rate of postoperative mortality and major complications (defined as intraabdominal abscess, peritonitis, anastomotic leakage and ileus) among patients with carcinoma of the esophagus, stomach, colon, rectum or pancreas who received total parenteral nutrition providing 37 kcal per kg of body weight a day for ten days before operation. The control group was offered a regular 2,400-kcal hospital diet. The investigators attributed the salutary clinical results to the improvement in humoral and cellular immunocompetence and protein status that was observed in the total parenteral nutrition-treated group. It is important to note that a deterioration in these nutritional indices occurred in patients in the control group, evidently due to medical conditions or diagnostic procedures that precluded consumption of the oral diet offered.

Thus, current information suggests the value of administering total parenteral nutrition for at least five to ten days before an elective operation for patients who are malnourished or for normally nourished patients in whom a lengthy preoperative evaluation may interfere with adequate oral intake.

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Carcinoma of the Pancreas

CARCINOMA OF THE PANCREAS is the eighth most frequently occurring cancer and the fifth most common cause of death from cancer in the United States. Since 1937 the incidence of the disease has increased in the United States and Europe. Tobacco, diabetes and diet have been incriminated as factors associated with increased risk of pancreatic carcinoma. While coffee was incriminated as a factor in one report, its causal role in the development of pancreatic cancer has been vigorously challenged from other sources. That coffee has any role in the development of pancreatic cancer remains an unproved assertion at this time.

There is still no feasible screening test for cancer of the pancreas which would permit early detection of this highly aggressive tumor that has a median survival of 3.3 months after histologic confirmation and a one-year survival of 11.9 percent. However, once carcinoma of the pancreas is suspected on the basis of clinical findings, powerful diagnostic tools are now available to confirm its presence. These are transhepatic cholangiography, endoscopic retrograde cholangiopancreatography and, to a lesser extent, ultrasonography, angiography and computerized tomographic scan. A preoperative histologic diagnosis can be established by

thin-needle biopsy, but in smaller lesions that have the best opportunity for resection the tumor may be missed. Therefore a percutaneous needle biopsy of the pancreas in which the findings are negative for tumor does not rule out carcinoma of the pancreas.

Five-year cures of pancreatic carcinoma are still rare and are usually associated with lesions in the head of the pancreas where common bile duct obstruction occurs early. Lesions of the body and tail seldom come to attention until they have spread beyond the confines of the pancreas. Pancreatoduodenectomy remains the best palliation for the 15 percent to 20 percent of patients found to have resectable lesions in the absence of metastases. The hope that more extensive resections such as total pancreatectomy would provide improved cure rates has proved to be unfounded. The addition of vagotomy at the time of pancreatoduodenectomy does not seem to reduce the incidence of peptic ulceration and gastrointestinal hemorrhage in patients undergoing pancreatoduodenectomy for cancer.

The 40 percent to 50 percent of patients with metastasis or locally unresectable cancer of the pancreas, most of whom are jaundiced but well enough to undergo celiotomy, are best managed by the simplest biliary bypass possible, that is, cholecystojejunostomy and chemical splanchnicectomy with administration of a solution of 15 ml of 6 percent phenol or 100 percent alcohol to provide pain relief. There is no evidence that the incidence of cholangitis is less with either Roux-en-Y cholecystojejunostomy or choledochojejunostomy. Most authors advocate gastrojejunostomy at the time of biliary bypass, otherwise 20 percent of patients will require a second operation for gastric outlet obstruction. There is a high incidence, about 20 percent, of gastrointestinal bleeding after biliary bypass in patients with pancreatic cancer. In many of these patients, the gastrointestinal bleeding is a major contributor to the death of the patient. The cause of peptic ulceration and bleeding in these patients is believed to result from the diversion of bile from the duodenum in patients whose gastrointestinal tract has already been deprived of pancreatic secretion as a result of tumor obstructing the proximal pancreatic duct.

The use of percutaneous transhepatic tube decompression of the obstructed common duct can be helpful in improving liver function in patients being prepared for resection who have been jaundiced for more than a month.

Percutaneous transhepatic decompression is not a substitute for operative biliary and gastric bypass and chemical splanchnicectomy except in a patient too ill to undergo celiotomy. A further disadvantage of percutaneous transhepatic decompression is that some patients with curable ampullary or distal common bile duct lesions who have a much more favorable prognosis than patients with pancreatic cancer may not be identified and resected. An additional disadvantage of percutaneous transhepatic decompression in patients with carcinoma of the pancreas is that the incidence of cholangitis is higher than after operative cholecystojejunostomy.

Chemotherapy with present regimens has not provided appreciable prolongation of life in patients with pancreatic cancer, though with some of the more recent combination chemotherapy the incidence of response has reached the 40 percent level.

Irradiation with heavy ions that can be better focused and have greater penetration has shown some promise with or without adjunctive chemotherapy in patients with locally unresectable lesions. However, the number of patients treated with these modalities has been small and a somewhat selected group. Radiation therapy with interstitial implants into the primary tumor is also being used but is a very cumbersome and logistically difficult technique to carry out in the operating room. The combination of irradiation and chemotherapy seems to have shown the greatest number of patients surviving as long as 40 months.

Local heating of tumors by ultrasonic or diathermic means has not yet proved applicable to the pancreas.

In summary, there is a need for a tumor marker to assist in screening the at-risk population. All attempts at cure of pancreatic cancer to date have to be considered, at best, palliative measures. Pancreatoduodenectomy offers the best palliation in patients who have small localized lesions without metastases. The procedure can only be justified if the mortality is low and should therefore not be done by an occasional operator.

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Trauma Care—Recent Advances

TRAUMA, defined as accidental or intentional injury, is the most common cause of death in persons aged 1 to 38 years. The death rate for trauma in the age group 15 to 24 has risen from 106 per 1,000 in 1968 to 120 per 1,000 in 1978. During that same period, the overall mortality for persons aged 25 to 64 declined 16 percent. Trauma mortality in the United States is 50 percent higher among American teenagers than for teenagers in Sweden, England and Japan combined. The estimated cost of death and disability due to trauma is in excess of $228 million annually. Only recently has information become available that allows rational evaluation of the potential efficacy of different aspects of the emergency health care system.

Concerning prehospital care, improvement in transportation and training of ambulance personnel has resulted in identifiable benefits in some areas of emergency